NESTING OF THE WHITE-RUMPED SHAMA (*COPSYCHUS MALABARICUS*) IN SOUTHERN VIETNAM

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ABSTRACT

We describe nesting of the White-rumped Shama (*Copsychus malabaricus*) in artificial and natural nest cavities in lowland tropical forest and seral stage habitats at Cat Tien National Park and Biosphere Reserve in southern Vietnam. The data was collected from March 7 until July 7 in 2008 in Cat Tien National Park, South Vietnam, on 168 artificial nesting boxes. All taken nest boxes were occupied only by White-rumped Shama. It took up boxes in all studied habitats: in the Lagerströemia forest 61.5% of nest boxes was occupied, in shrub habitat (low brush and bamboo tangles) 55.8%, and in forest edges 44.1%. Clutches were found in 73 boxes (43.4%). The full clutches contained 1–4 eggs, most of them (62%) had three eggs. In average, the hatching was observed 13.4 days after egg-laying. The size of Shama male's territory was 0.3 ha. Nest-building, brooding, feeding of young, nest predation, interspecific competition for breeding sites in native natural habitat are described.

Key words: White-rumped Shama, Copsychus, *artificial nest boxes, hole-nesting birds, southern Vietnam.*

INTRODUCTION

This study forms part of a major ecological research effort conducted by the Joint Russian-Vietnamese Tropical Research and Technological Centre. The main goal for the scientific program of this Institute is to study the diversity, structure and dynamics of Vietnam's forest ecosystems. Ornithological research was begun in 1989. During the early period of operations, most of the work involved short-term visits to selected forest sites. Later we had the opportunity to broaden our surveys to include all major forest habitats throughout the country. As a result of this work, we now have a solid understanding of the diversity of ornithological communities in different forest types of Vietnam and pilot data on trophic niches and other aspects of the biology for most Vietnamese forest birds. With this sound foundation, we are now prepared to focus our attention on long-term investigations of the biology of individual bird species or small ecological or systematic groups on selected forest plots. One of these plots was established in Cat Tien Biosphere Reserve in the southern part of Vietnam.

Nesting in holes is an interesting phenomenon, especially in tropical forest where predation pressure and competition among hole-users is assumed to be high. Most hole-nesters in southeast Asian lowland tropical forest are nonpasserines: woodpeckers, barbets, hornbills, parakeets, owls and trogons. Most of these species nest in holes that are in high in the forest canopy (> 10–15 m), so detailed study of the nesting habits of these birds is not possible without the use of special techniques. Hole-nesting passerines of the area of study include two rather uncommon species of forest starlings (Common Hill-Mina *Gracula religiosa* and Golden-crested Myna *Ampeliceps coronatus*), the Velvet-fronted Nuthatch (*Sitta frontalis*) and two species of the genus *Copsychus*: the White-rumped Shama (*C. malabaricus*), one of the most common bird species in forests and forest

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edges in Vietnam; and the Oriental Magpie-Robin (*C. saularis*), a locally common bird of forest borders.

The White-rumped Shama and the Oriental Magpie-Robin are both insectivorous, middle-sized birds (Muscicapidae). Under natural conditions, shamas build cup-shaped nests in natural holes in tree trunks, tips of stumps, or in the basal stem clumps of bamboo. Magpie-robins also prefer hollows in the trunk of a tree trunk, but often use different kinds of fissures, e.g., interstices in cliffs or ricks of aerial roots (Collar 2005: 765–766, Siddique 2008). We chose hole-nesting birds for this initial study because they present three advantages over open-nesting species: 1) they often will accept artificial nest sites, allowing the researcher to set the parameters for nest location; 2) no nest-search is required; and 3) it is relatively simple to associate a particular pair with a specific nest site.

The main purpose of our study was to try to understand what features of the biology of these two model species favor hole-nesting in this rich tropical forest ecosystem. To this end, we placed nest-boxes in different habitats around the study area.

MATERIALS AND METHODS

The data were collected from March 7 until July 7 in 2008 in Cat Tien National Park and Biosphere Researve, Vietnam. Cat Tien is located 160 km NE from Hochimin City, Dongnai Province, 11°25'N, 107°25'E, c. 300 m above sea level. Climate is typically monsoon, with a wet season that usually includes the period from May or June to October or November. Mean annual temperature exceeds 18°C.

Our study plot was situated in an eastern part of the reserve in an area that is a mosaic of tall forest, different types of forest edges, shrub habitat (low brush and bamboo tangles), and grasslands with a few remaining forest trees, which was created by logging in the 1970s and 1980s. Several small depressions on the study area are flooded during the wet season from July to October.

Artificial nest boxes provide enhanced opportunities for intensive studies of hole-nesting species (Hume 1890, Gibson *et al.* 1982), and previous work has indicated that our study species would use such sites (Aguon & Conant 1994, Lock Nga Yi 2000, Yip 2006). Therefore, we determined to use artificial nest boxes in this study. In March of 2008, we distributed 158 nest boxes along 5 transects in different habitats (FIG. 1): 91 nest boxes in Lagerströemia forest, a habitat in which the dominant tree species include *Lagerströemia* sp., *Tetrameles nudiflora*, *Afzelia xylocarpa* and characterized by some disturbance by logging, a largely closed canopy, and considerable undergrowth; 43 boxes in shrubby, tree-less habitats with bamboo tangles (dominated by Poaceae and Zingiberaceae); and 24 boxes in forest edges, gardens, and overgrown Cashew and Grewia plantations with little closed-canopy. Later, at the end of May, another 10 boxes were placed in the territory of a pair of Magpie Robins located in forest edge.

We used black wooden nest boxes, 28 cm high and 15 cm square. The hole diameter was 5.5 cm; distance between it and top of the box was 11 cm. Boxes were placed on middle-sized trees, 1.5–3 m above ground. Distance between boxes normally 50 m, but sometimes less.

Nest boxes were regularly checked. All animals and their nests except the study species were removed. During the nest examination, all bird nests, clutches and young were described and measured, fledglings were ringed by metallic and colored plastic rings as well as adult birds which were trapped by mist-nets near the nest boxes (mainly females) or sometimes distant their nests (birds of both sexes).

We made observations near the nests and from different distances to collect data about bird's behavior but it was seen that our presence made some artificial impact in it, and this part of the work will be modified in future studies. Also observations on 45 h of behavioral observations were accumulated on males of three different pairs, at times supplemented by the stimulus of song playback.

RESULTS

During our first year of work, nest boxes were occupied only by one of the study species, the White-rumped Shama so our data on the Magpie-robin were limited to several observations of adult birds and one record of a fledgling. For the shama, we were able to ring and make observations on 28 adult females, 18 adult males, and 154 nestlings. Shamas used nest boxes in all types of habitat with evidence of some preference for tall forest (Fig. 2). The rather high breeding density in open areas was a surprise for us. One possible reasons for this behavior could have been our provision of nesting sites. Nest box occupancy rate was rather high: 95 of 168 boxes or 56.5% were used by birds for nest building, and clutches were found in 73 boxes (43.4%). The difference in boxes used for nest construction as opposed to those used for egg-laying occured because adult males

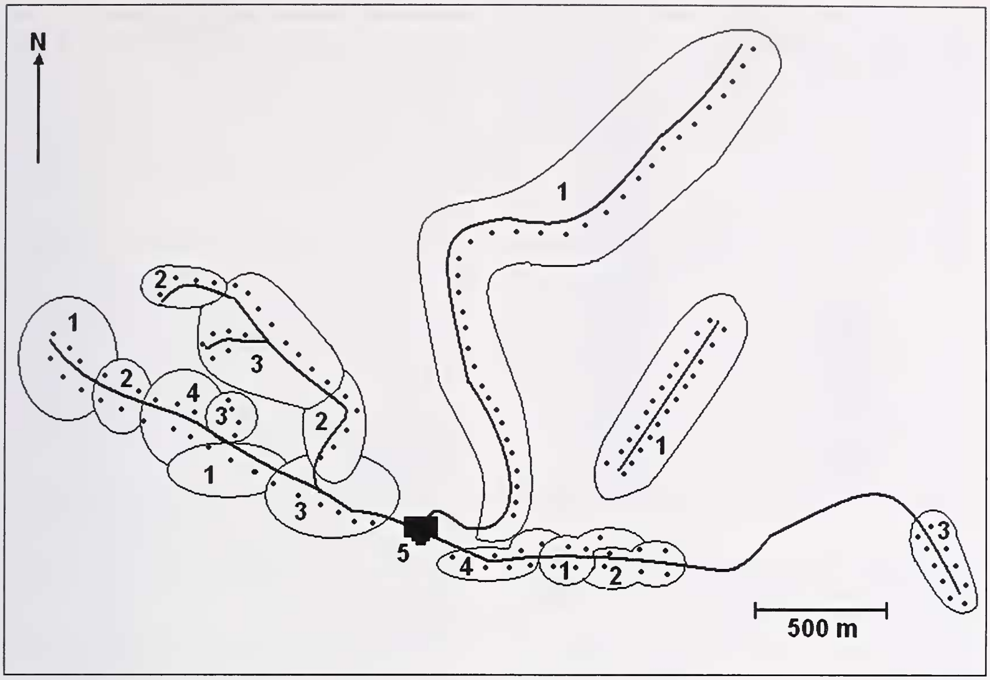

FIG. 1. Scheme of boxes distribution over different habitats. 1 – forest, 2 – bamboo, 3 – forest edges («garden»), 4 – shrub habitat (low brush and bamboo tangles), 5 – Reserve office.

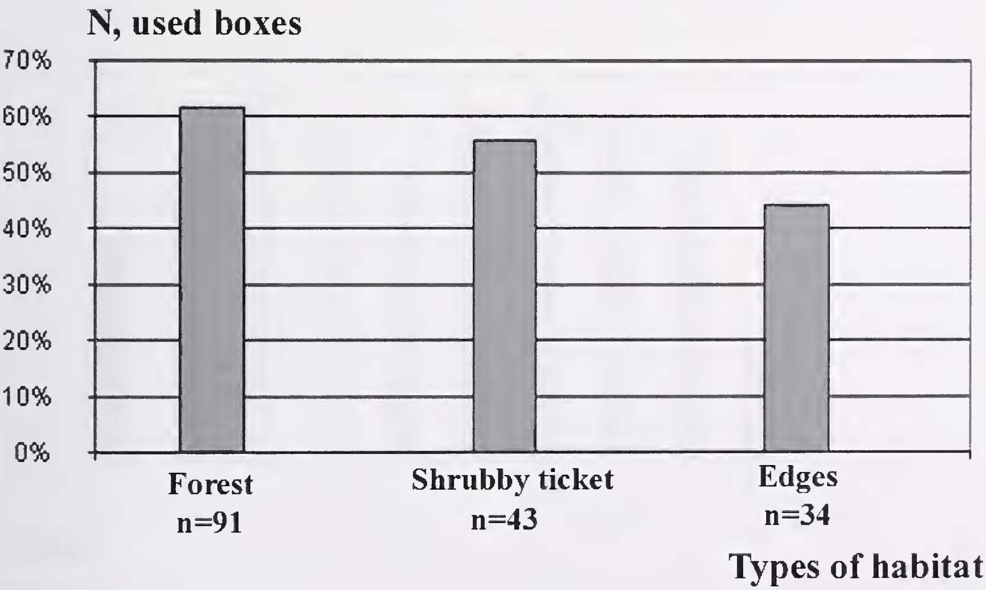

FIG. 2. Degree of box colonization by White-rumped Shama in different types of habitat.

initiated nest construction in more than one box, among which females would select one to complete nest building and laying of the clutch (Aguon & Conant, 1994). Second clutches were observed in 19 nests (26%), and in two cases third clutches of the same pairs were registered.

The density of shama nests was highest in the *Lagerströemia* forest and shrub habitats. Majority boxes in the «garden» habitat were not used (Fig. 2). In the *Lagerströemia* forest, shamas occupied 61.5% of nest boxes (56 of 91), in shrub habitats – 55.8 % (24 of 43), and in forest edges – 44.1% (15 of 34).

The first clutches were documented on March 25, shortly after the boxes were put in place (8–20 March). We don't know the end date of nest-box use for shama reproduction because the study was terminated on 7 July at a time when two new nests had recently been completed and one box still contained a 7-day old brood (Fig. 3). The minimal interval between nest box hanging and occupation was 14 days in the «garden» habitat, 17 days in the forest habitat, and 19 days in shrub habitats.

Most of the full clutches contained 3 eggs (62%, n=58), 31% clutches (n=29) had 4 eggs, 4 clutches (5%) – 2 eggs, and 3 (2%) clutches – one egg (Fig. 4). The female lays one egg per day. Permanent incubation started after the last egg was laid. During this time the male doesn't feed the female, but he spends his time not far from the nest. In one case a male visited his nest box 4 times during hatching when a female was absent. The male spent from 40 s to 4 min 50 s in the box, an average of 3.0 min (n=4). Presumably he visited a nest box for assisting in the hatching process.

On average, hatching occurred 13.4 days after egg-laying (n=8). Observations of three nests (4 hours per day) showed that the female did not take part in the feeding of young during the first five days after hatching. She spent almost all her time during this period brooding her young, whereas the male brought food for the chicks and, probably, for the female. After the fifth day, the female helped in the feeding of the young, and was just as active in this role as the male. The duration the nestling period was 12–13 days, and then young birds left the nest. Fledglings spent some time together with parents: we registered a case of feeding the young one month later fledging.

For three shama couples, the nesting cycle lasted for 33-34 days (the time from beginning of nest building till fledgling). The time period from the end of fledgling care until the laying of the first egg of the

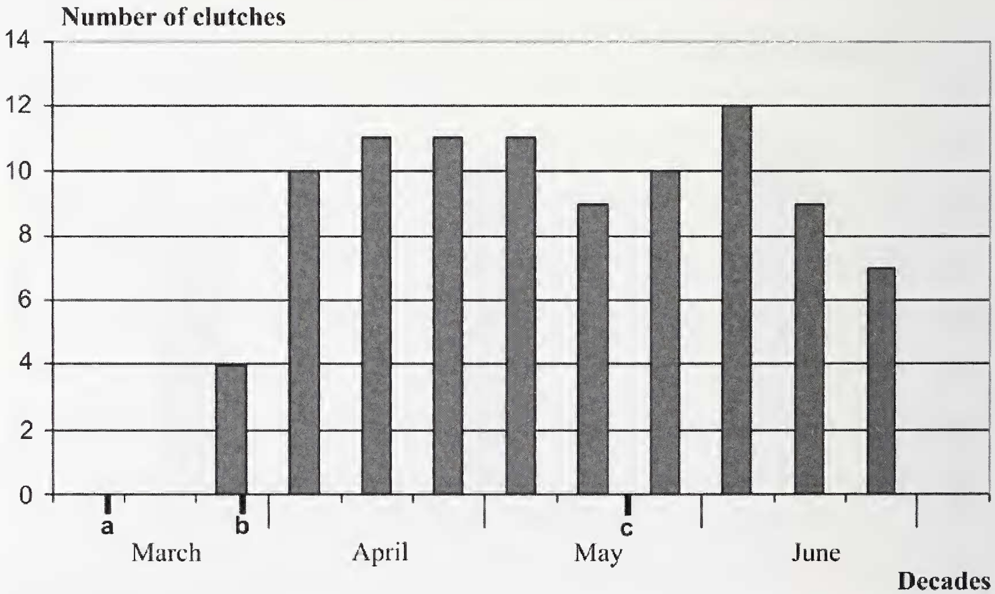

FIG. 3. Quantity clutches distribution during breeding season. «a» – start (8 March 2008) and «b» – end (26 March 2008) of boxes displacing, «c» – 10 boxes added.

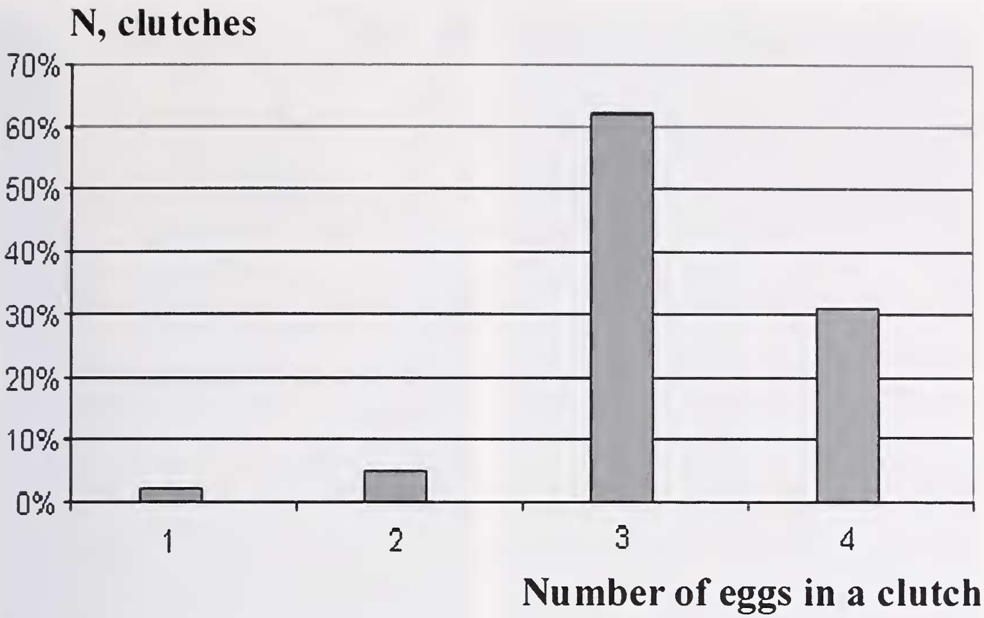

FIG. 4. Number of eggs in a clutch White-rumped Shama in 2008.

second clutch for these couples lasted for 22, 24, 24 and 25 days. Intervals between the second and the third clutches were 14 days and 15–16 days.

Clutch mortality was low: 14 of 94 shama clutches were destroyed (14.9%). In two nest boxes, the females had been killed too. Eight clutches were destroyed prior to hatching and 6 during the nestling period. Some nest boxes were used by species that could be predators on, or otherwise harm, shamas including: rats *Niviventer*, tree mice *Chiropodomys gliroides*, tree-shrews *Dendrogale murina*, big spiders, scolopendras and scorpions. In addition, several species of ants occupied various nest boxes as well some other bird species (*Camponotus* sp., *Crematogaster* sp., *Diacamma rugosum*, *Monomorium* sp., *Anoplolepis gracilipes*). Interestingly, big black ants *Polyrhachis armata*, which also occupied nest-boxes, defend them from all other animals including birds. *Polyrhachis armata* was registered in 25 boxes, and may be regarded as a major competitor for shamas in terms of hole use in our study area. Several boxes were also used by bees (three boxes) and wasps (nine boxes).

We tried to keep boxes free from the nesting of insects and mammals as well as from any other competitors. During four months of field work, we removed competitors from 47 boxes (28%). However, the real rate of competition may be lower, because some of competitors were found in boxes after shama breeding was successfully finished. The average breeding territory size (based on three males) was 0.3 ha.

With help from colleagues we found six shama nests in natural cavities. Five of them were found distributed in forest habitat, and one in a housing area of the national park. Of these natural nests, we were only able to study one in detail. This nest was built in a tiny hole of a dry fallen branch (3 m in length, 10 cm in diameter) that was drooped over lianas about 1 m above the ground (Fig. 5). The depth of the hollow was 24 cm, distance between the nest and entrance – 18 cm. Other nests were placed in natural holes or cavities in 3–9 m above the ground, and three of them were concealed by epiphytes (*Dendrobium* sp.).

During the nest building the female shamas are cautious (Aguon & Conant 1994). Based on our observations of two males and one female made in *Lagerströemia* forest the males first builds a platform inside the hole using dry bamboo or tree leaves and other plant materials. In most cases, the males collected materials near the nest, usually within three m. This process was intensive, and lasted for two or

FIG. 5. Shama's nest, built in native cavity; a – general view, b – the nest.

three days. When the male was finished, we found that there was a friable leaf cushion on the bottom of the box. After that, the female added some materials to structure, preparing a tray of hyphae (*Marasmius* sp.), dry thin leafstalks and, sometimes, flakes of dry snake skin or polyethylene. She also collected material normally from nearby the nest box (< 5 m), and finished her work in two-three days. In total, nest building takes 4–7 days in shamas.

DISCUSSION

We present data on shama clutch size, adult male, and female behavior in different stages of breeding, phenology of breeding, and other features of life history of the species. Previously data on some aspects of its breeding biology were collected for a population introduced to Hawaii Islands (Aguon & Conant 1994). Work on this Hawaiian population found that, under natural conditions, birds from O'ahu Island lay only one or two clutches per season, although captive birds could raise as many as five clutches per season. In our research we found only two pairs out of 73 that had a third clutch per season. Presumably this difference in number of clutches per season can be explained by differences in the environment between southern Vietnam and Hawaii.

During the breeding season we found that 19 out of 95 occupied nest boxes contained unfinished nests (consisting of leave cushions only). We suppose that in these cases males built more than one nest for a female to choose from. According to the literature male shamas build several nests simultaneously. A female then chooses the most appropriate place for the nest among them (Aguon & Conant 1994). However, unfinished nests might also belong to unpaired males.

Interestingly shamas initiated breeding activities in the «garden» habitat earlier than in others. The number of clutches increased in the first half of the breeding season and then gradually decreased. The histogram in Fig. 3 shows two small peaks, which may be related with both to initiation of second clutches by some pairs. Probably the high density of nest box occupation is related to birds gradually finding the new breeding sites represented by the placement of the artificial nest boxes.

The density of shama's nest box occupation was quite high. To compare, in the reserve «Bryansky Les» (European Russia) the common hole-nesting passerine, the Pied Flycatcher (*Ficedula hypoleuca*), nested in 50.2% boxes (n=215) in the first year of using nest-boxes (2005; Palko, unpublished data).

We suppose that the whole forest territory of Cat Tien national park is covered by adjoining home ranges of White-rumped Shama males. This assumption is based on visual observations of marked birds, capture data, observation of the high density of this species in forest habitats, frequency of territorial conflicts, and the complicated structure of the environment.

According to our results the home range of shama males averages 0.3 ha in size. This differs significantly from the Hawaiian population, were a male's home range is about 0.09 ha (Aguon & Conant 1994).

We do not know why Oriental Magpie-Robins did not use the artificial nest boxes provided. Possibilities include: 1) population density was significantly lower than that of the shama; 2) nest box construction or placement did not meet the species' requirements; or 3) lack of information on the biology and status of the bird in southern Vietnam.

In conclusion we found that the experiment of hanging artificial nest-boxes in a tropical forest was valuable. In 2008, 56.5% of nest-boxes were occupied by shamas. Next year we will try to include the second species of hole-nesting passerines that we know of in the area, the Oriental Magpie-Robin.

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